

REVIEW OF THE BLASTOBASINAE (LEPIDOPTERA: GELECHIOIDEA: COLEOPHORIDAE) OF THE GALÁPAGOS ISLANDS

DAVID ADAMSKI AND BERNARD LANDRY

(DA) 6033 Majors Lane, Apt. #2, Columbia, MD 21045, U.S.A.; (BL) Department of Environmental Science, Policy and Management, 201 Wellman Hall, University of California, Berkeley, CA 94720, U.S.A.

Abstract.—*Calosima darwini*, new species, is described from the Galápagos Islands, Ecuador, and is the first member of the genus known beyond North America. *Auximobasis normalis* Meyrick, 1918 is a senior synonym of *Blastobasis crotospila* Meyrick, 1926, and is redescribed and transferred to *Blastobasis* Zeller, 1855. A key and illustrations of adults, including male and female genitalia, are provided for the two species of Blastobasinae known from the Galápagos Islands.

Key Words: South America, Ecuador, Galápagos, Lepidoptera, Gelechioidea, Coleophoridae, Blastobasinae, *Calosima*, *Blastobasis*

The Lepidoptera of the Galápagos Islands are known incompletely. Although a number of collections have been made and reported, they have been restricted to the larger moths and the butterflies (Beebe 1923, Butler 1877, Schaus 1923, Hayes 1975). Consequently, the microlepidoptera remain known only partially. Eleven species were recorded by Meyrick (1926), and four were added by Linsley and Usinger (1966) and Linsley (1977). Recent collections by Robert Silberglied in 1969 and more recently by Bernard Landry in 1989 and 1992 have resulted in considerably more specimens of microlepidoptera than have been available previously. For example, Landry amassed more than 3,000 specimens of microlepidoptera in 5 months of collecting on the Galápagos Islands. Studies of this material have yielded publications on Pterophoridae (Landry and Gielis 1992, Landry 1993), Choreutidae (Heppner and Landry 1994a), Heliodinidae (Heppner and Landry 1994b), and the present paper on Coleophoridae (Blastobasinae).

The Blastobasinae are probably one of the most commonly collected groups of Gelechioidea in the Americas. Yet this subfamily may be one of the least known to science. Generally, species are drab with few, if any, diagnostic wing color patterns, making identifications difficult unless the genitalia are examined.

Since Meyrick (1894) the Blastobasinae have been considered to be a monophyletic group. Recent studies (Adamski and Brown 1989, Hodges, in press) have corroborated this notion and have rigorously established relationships of the Blastobasinae within Gelechioidea. In this work the Blastobasinae (*sensu* Adamski and Brown, 1989) are treated as a subfamily within the Coleophoridae.

MATERIALS AND METHODS

Collecting methods and information on the islands visited are found in Landry and Gielis (1992) and Landry (1993). Specimens were prepared (pinned and mounted)

in the field as demonstrated by Landry and Landry (1994).

The Methuen Handbook of Colour (Kornerup and Wanscher, 1978) is used as a color standard for the description of the adult vestiture. More than 150 specimens of Blastobasinae were examined, including type specimens. Genitalia were dissected as described following Clarke (1941), except mercurochrome and chlorazol black were used as stains. Pinned specimens and genital preparations were examined with dissecting and compound microscopes. Wing measurements were made using a calibrated ocular micrometer.

RESULTS

KEY TO THE BLASTOBASINAE
(COLEOPHORIDAE) OF THE GALÁPAGOS
ISLANDS

- 1. Male 2
- Female 3
- 2. Forewing pattern with or without median fascia, with a single midcell dot and two dots near distal end of cell (Figs. 2-7); hindwing cubitals of equal length (Fig. 11); first flagellomere dilated forming a notch; apex of uncus rounded gnathos with two medial dentitions, proximal flange without dilation (Fig. 12); aedeagus short, slightly angled (Fig. 13) *B. normalis* Meyrick
- Forewing pattern without median fascia and with a single midcell dash and one dot on distal end of cell near cubitus (Fig. 1); hindwing cubitals of unequal length (Fig. 10); first flagellomere not dilated; apex of uncus obtuse, gnathos without dentitions, proximal flange with an angular dilation (Fig. 8); aedeagus long, sickle-shaped (Fig. 9) *C. darwini*, n. sp.
- 3. Forewing pattern with or without median fascia, with a single midcell dot and two dots near distal end of cell (Figs. 2-7); hindwing cubitals of equal length (Fig. 11); ostium near seventh sternum, anterior margin of eighth sternum entire, ductus seminalis near ostium, ductus bursae long, signum hornlike (Fig. 15) *B. normalis* Meyrick
- Forewing pattern without median fascia, with a single midcell dash and one dot on distal end of cell near cubitus (Fig. 1); hindwing cubitals of unequal length (Fig. 10); ostium near eighth sternum, anterior margin of eighth sternum notched, ductus seminalis not close to ostium,

ductus bursae short, signum platelike (Fig. 14)
..... *C. darwini*, n. sp.

***Calosima darwini* Adamski and Landry,
new species**
(Figs. 1, 8-10, 14)

Diagnosis.—Forewing with a midcell dash; male genitalia with apex of uncus obtuse, ventrally keeled; dorsal part of proximal flange dilated; juxta divided; aedeagus long and sickle-shaped; female genitalia with widened base of ductus seminalis, and signum keeled longitudinally.

Head: Vertex and frontoclypeus with white scales intermixed with tricolored scales, basal 2/3 white, pale grayish brown distally, with a white apex; some specimens have mostly tricolored scales on vertex intermixed with white scales; outer surface of labial palpus pale grayish brown intermixed with white scales, mostly white to near distal margin of segments, inner surface white intermixed with few pale grayish-brown scales; antennal scape and pedicel white, flagellum pale brown; proboscis white intermixed with pale grayish-brown scales.

Thorax: Tegula and mesoscutum white intermixed with tricolored scales, or mostly pale grayish-brown scales intermixed with few white scales. Legs with outer surface brown or pale-brown scales intermixed with white scales. Scales white to near distal margin of segments; inner surface of legs white. Forewing (Fig. 1): length 4.0-6.9 mm (n = 24), mostly white intermixed with tricolored scales, or both types of scales intermixed about equally; basal 1/2 of radius and cubitus demarcated by brown scales, a brown dash about midcell, and a brown dot within distal part of cell near cubitus, (these markings may be faint or absent in some rubbed specimens); submarginal scales mostly pale brown or brown, marginal scales mostly white; undersurface uniform pale brown. Venation (Fig. 10), with M₃ arched and cubitals originating from common area. Hindwing with both surfaces uniform pale brownish gray; venation (Fig. 10)



Fig. 1. Holotype of *Calosima darwini*.

with CuA_1 branched from M_3 near base, M_2 broadly arched toward M_1 .

Abdomen: White.

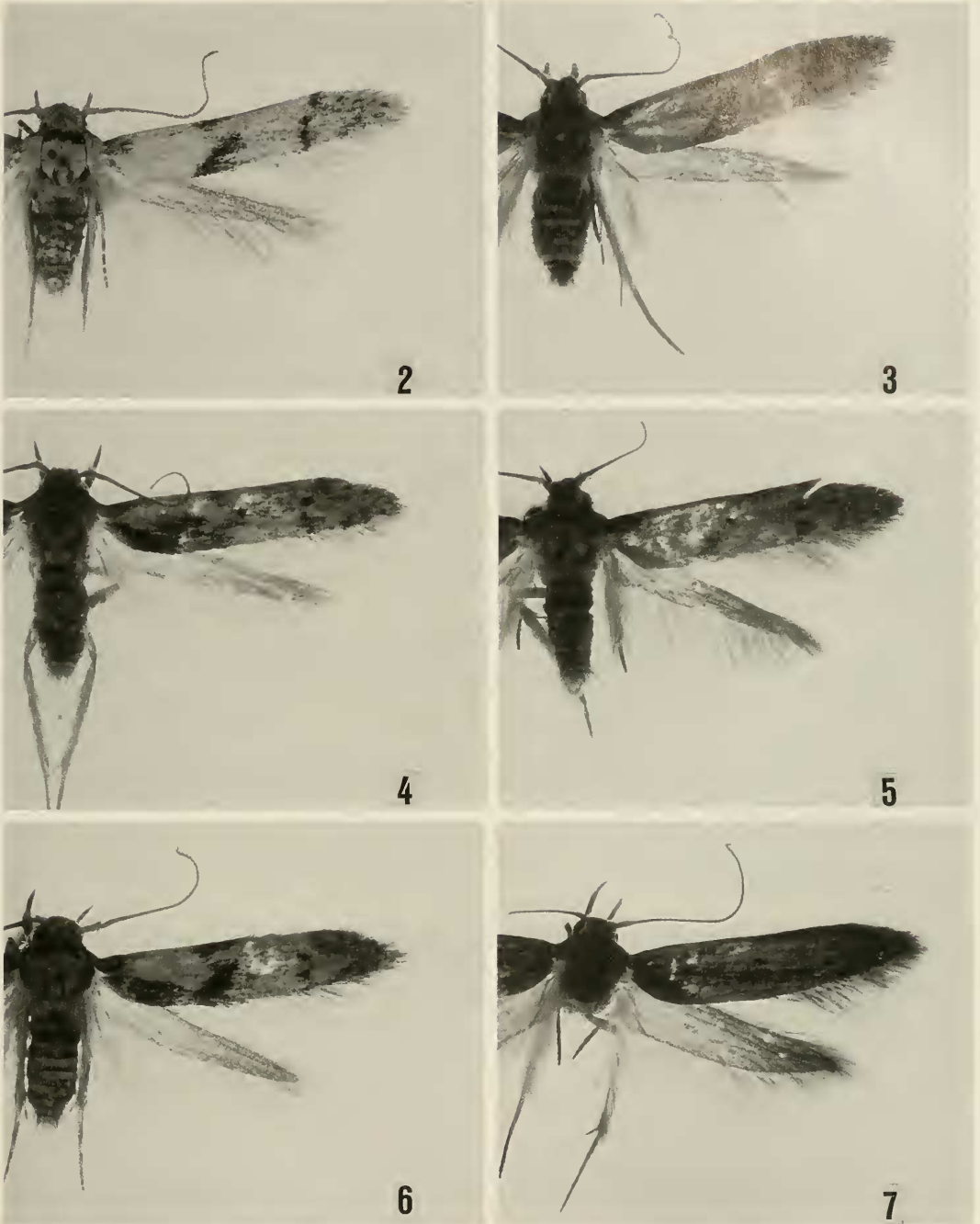
Male Genitalia (Figs. 8–9): Uncus ventrally keeled, apex obtuse, slightly narrowed basally, with two pairs of ventral setae; base of uncus with two small depressions; dorsal margin of gnathos slightly rounded; distal $\frac{3}{4}$ of digitate upper division of valva setose, lower division basally widened, acuminate; dorsal part of proximal flange dilated, dilation angular and setose; juxta divided forming two semicircular bands; vinculum narrow, medially acuminate; aedeagus long and slender, sickle-shaped, slightly bulbous basally; anellus with microsetae.

Female Genitalia (Fig. 14): Ovipositor telescopic, in three membranous subdivisions; ostium near anteriorly notched eighth sternum; antrum membranous and undifferentiated from ductus bursae; ductus seminalis widened basally, narrowed distally; corpus bursae with large platelike signum, lon-

gitudinally keeled and narrowed posteriorly.

Holotype.—♂, "ECUADOR, GALAPAGOS, San Cristobal, 2 km, SW P[uer]to Baquarizo [sic], 11/II/1989, M[ercury] V[apor] L[ight], B[ernard] Landry". Deposited in the Canadian National Collection [CNC]. Specimen not dissected.

Paratypes.—Floreana: 3 ♂, "ECU[ADOR], GALAPAGOS, Floreana Punta Cormoran, 21/IV/1992, MVL, leg. B. Landry", specimen not dissected; 2 ♀ same data as above except; "23/IV/1992", specimens not dissected. Rabida: 1 ♂, 1 ♀, "ECU[ADOR], GALAPAGOS, Rabida, Tourist trail MVL, 3/IV/1992, leg. B. Landry", specimens not dissected. San Cristobal: 2 ♀, "ECUADOR, GALAPAGOS, San Cristóbal, 2km SW P[uer]to Baquarizo [sic], 11/II/1989, MVL, B. Landry", specimens not dissected; 1 ♀ with same data as above except; "17/II/1989", "♀ genitalia slide by D. Adamski 3312" [green label], "♀ wing slide by D. Adamski 3350" [green label].



Figs. 2-7. Adults of *Blastobasis normalis*, variation.

Santa Cruz: 3 ♂; "ECUADOR, GALAPAGOS, Santa Cruz, Arid Zone, 17/II/1989, MVL, B. Landry", "♂ genitalia slide by D. Adamski 3285" [green label], "♂ genitalia

slide by D. Adamski 3293" [green label]; 1 ♂ paratype not dissected; 6 ♀; 1 ♀ with same data as above, [specimen not dissected]; 2 ♀ with same data as above except:

"16/I/1989", "♀ genitalia slide by D. Adamski 3287" [green label]; "29/I/1989" [specimen not dissected]; 3 ♀; "ECU[ADOR], GALAPAGOS, Santa Cruz, E.C.C.D., 4/III/1992, MVL, leg. B. Landry" "♀ genitalia slide by D. Adamski 3286" [green label]; 1 ♀ with same data as above except; "6/III/1992, UVL", specimen not dissected; 1 ♀ with same data as above except; "Conway, 14/IV/1992", "♀ genitalia slide by D. Adamski 3288" [green label]. 5 ♀ specimens collected by R. Silberglied with the following data: "GALAPAGOS I[SLANDS], SANTA CRUZ; Academy Bay, C[harles] Darwin Res[earch] Station], Aug[ust] [19]70, Alt[itude] (+, -) 5m, R. Silberglied", "at 15w UVL blacklight", "♀ genitalia slide by D. Adamski 615" [green label]; 3 ♀ with same data as above except; "♀ genitalia slide by D. Adamski 616" [green label], "♀ wing slide by D. Adamski 843" [green label]; "♀ genitalia slide by D. Adamski 617" [green label], "♀ wing slide by D. Adamski 717" [green label]; one ♀ specimen with same data as above except; "25 FEB[ruary] [19]70", "♀ genitalia slide by D. Adamski 618" [green label]. Santiago: 1 ♀, "ECU[ADOR], GALAPAGOS, Santiago, Bahia Espumilla, 4/IV/1992, MVL, leg. B. Landry", "♀ genitalia slide by D. Adamski 3318" [green label]. 1 ♂ and 1 ♀ paratype are deposited in the National Museum of Natural History, Smithsonian Institution, [USNM] and The Natural History Museum, London [BMNH]. The five paratypes collected by R. Silberglied are deposited in the Museum of Comparative Zoology, [MCZ] Harvard University. The remaining paratypes are deposited in the Canadian National Collection [CNC], Ottawa and the personal collection of B. Landry.

Remarks.—This is the first record of *Calosima* beyond North America. *Calosima darwini* and *C. lepidophaga* (Clarke) are the only known Holcocerini that share a divided juxta.

Etymology.—*Calosima darwini* is named after Charles Darwin, whose obser-

vations of the flora and fauna of the Galápagos Islands are fundamental to evolutionary thought.

Blastobasis normalis Meyrick, 1918,
new combination
 (Figs. 2–7, 11–13, 15)

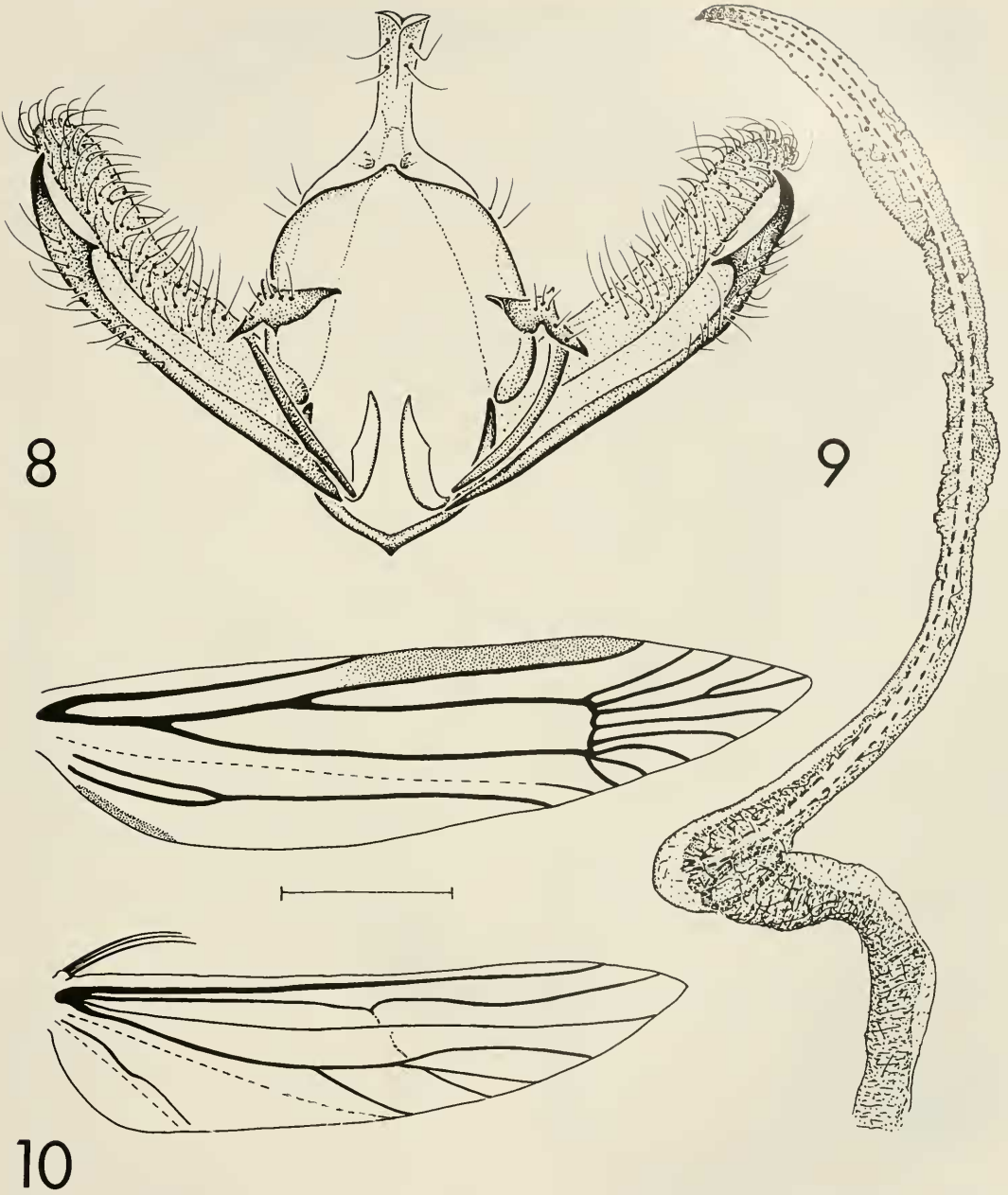
Auximobasis normalis Meyrick, 1918:2: 160.—Clarke, 1963:4:481.—Heppner, 1984:41.

Blastobasis crotospila Meyrick, 1926:74: 278.—Linsley and Usinger, 1966:33(7): 164.—Parkin et al., 1972:48(2):105.—Heppner, 1984:41. **New synonymy.**

Diagnosis.—Male genitalia with lower division of valva with long marginal setae; female genitalia with moderately dense microtrichia on membrane near ostium.

Head: Frontoclypeus and vertex variable; from grayish-brown scales tipped with white, to nearly white; darker specimens with scales in area between dorsal and ventral margins of antennal sockets with greater area of white or pale grayish brown on distal end, forming a transverse color band across frontoclypeus; outer surface of labial palpus brown or grayish brown intermixed with pale grayish-brown scales tipped with white, and few white and brown scales, each segment white to near distal margin; inner surface white or mostly white intermixed with pale-brown scales; antennal scape and pedicel patterned as above, male first flagellomere dilated, forming a notch, flagellum grayish brown; proboscis pale grayish brown intermixed with white.

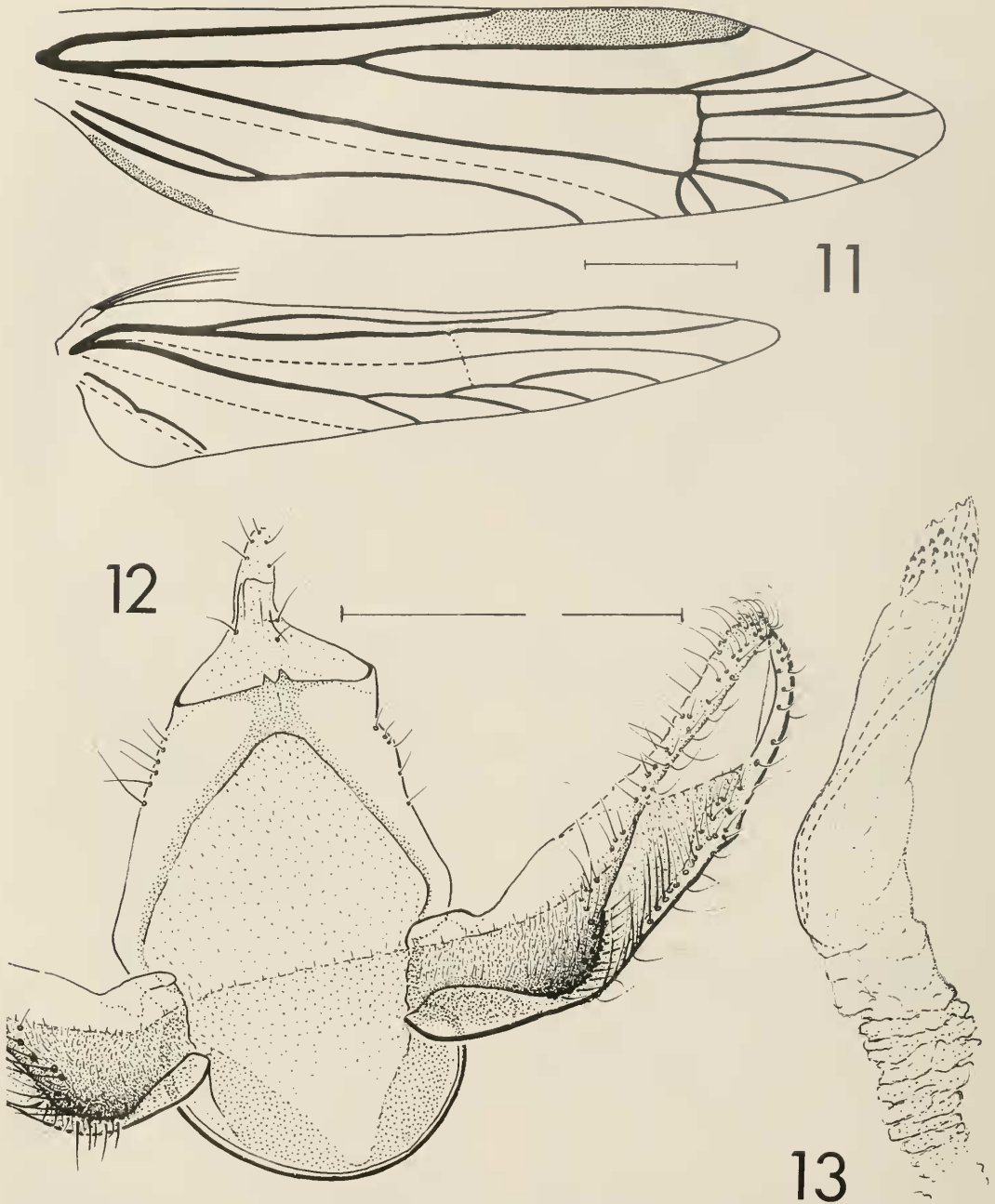
Thorax: Tegula, brown or grayish brown, grayish brown basally, pale grayish brown, or white distally; mesoscutum patterned as tegula except, scales tipped with pale grayish brown or white form a broad transverse color band. Legs: outer surface with scales grayish brown or brown tipped with white, white near midtibia and distal margin of tarsomeres; inner surface mostly white intermixed with pale grayish-brown scales. Forewing (Figs. 2–7): length 4.2–6.4 mm ($n = 129$), highly variable; grayish brown,



Figs. 8-10. *Calosima darwini*. 8, Genital capsule. 9, Aedeagus. 10, Wing venation. Figs. 8, 9, Line Scale = 0.5 mm; Fig. 10, Line scale = 1.0 mm.

pale grayish brown or brown, most scales tipped with white; median fascia present or absent, complete or incomplete; one dot near midcell and two dots near distal margin of cell; some specimens with a brown basal streak on posterior margin (Figs. 4,

6-7); marginal dots demarcating radial, medial, and cubital veins; female specimens usually darker than males; undersurface brown, pale brown basally; venation (Fig. 11) with M_3 and CuA_1 not strongly arched. Hindwing with both surfaces pale grayish



Figs. 11-13. *Blastobasis normalis*. 11, Wing venation. 12, Genital capsule. 13, Male aedeagus. Fig. 11, Line scale = 1.0 mm; Figs. 12, 13; Line Scale = 0.5 mm.

brown; venation (Fig. 11) with cubitus 4-branched with M2, M3 stalked near mid-length of preceding vein.

Abdomen: White.

Male genitalia (Figs. 12-13): Uncus par-

allel-sided with a rounded apex, sparsely setose; gnathos with a pair of small dentications; tergal setae present; digitate upper division of valva slightly narrowed medially, broad at base, ventral margin setose; outer

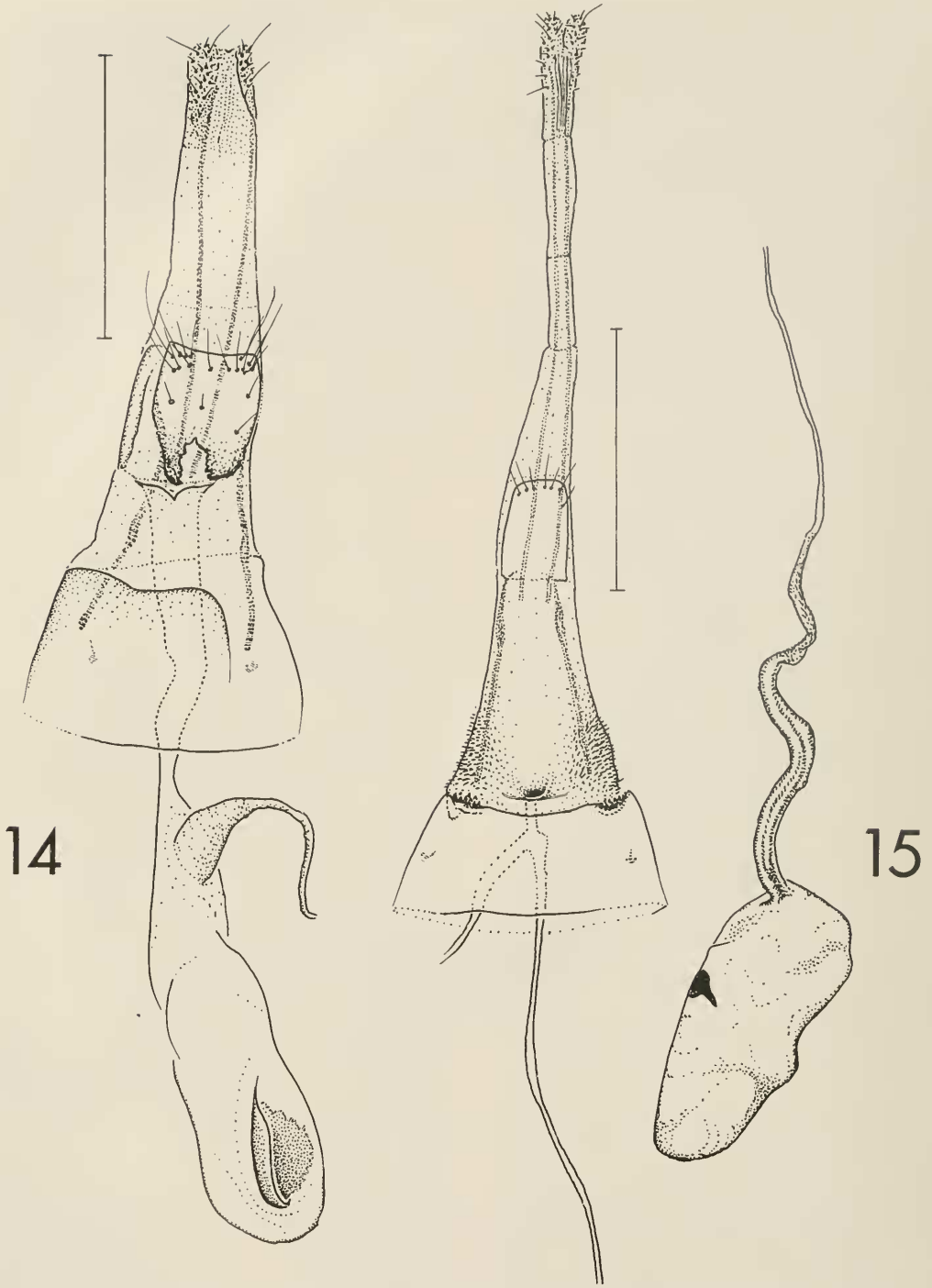
margin of proximal flange setose; diaphragma densely microtrichiate to margins of proximal flange; lower division of valva with long marginal setae; juxta bandlike; vinculum wide; aedeagus slightly angled, with several moderately stout anellar setae.

Female genitalia (Fig. 15): Ovipositor with four membranous subdivisions; ostium in membrane near posterior margin of seventh sternum; ostial membrane microtrichiate; two shallow and dentate invaginations within membrane near posterolateral margin of seventh sternum; antrum membranous, short, forming a common inception for ductus seminalis and ductus bursae; ductus bursae long with two rows of plate-like sclerotizations within anterior end; corpus bursae membranous, signum hornlike.

Types.—*Auximobasis normalis* Meyrick, Lectotype ♂, designated by Clarke (1963). "Lectotype" [disc label], "Huigra, 4500 f[ee]t, Ecuador, Parish, 6-14, Lectotype, *Auximobasis normalis* Meyrick, JFGC [larke], 1948" [hand-written label], "♂ genitalia on slide 5-X-1948, JFGC[larke] 8077" [hand-written label], "*Auximobasis normalis* Meyr., 15/1, E. Meyrick det. in Meyrick Coll[ection]" [hand-written label], "*normalis* Meyr." [hand-written label], "Meyrick Coll[ection], BM 1938-290". *Blastobasis crotospila* Meyrick, Holotype ♂, "Type, HT" [disc label], "James Island, Galapagos, at light, sea level, 26-7-[19]24, S[ain]t George Exped[itio]n, CL Collenette", "Brit[ish] Mus[eum] 1925-488", "M-48", "*Blastobasis crotospila* Meyr., Tr. Ent. Soc. Lond., p. 278(1926), Type ♂" [hand-written label], "BM ♂ genitalia slide no. BM 27204". Specimen is missing apical portion of both antennae, right labial palpus, right foreleg, and both midlegs.

Other specimens Examined.—Española: 1 ♂, "ECUADOR, GALAPAGOS, Española, Bahía Manzanillo, 25/IV/1992, MVL, leg. B. Landry", "♂ genitalia slide by D. Adamski 3304" [green label], 1 ♀ with same data as above except, "29/IV/1992", "♀ genitalia slide by D. Adamski 3303" [green label]. Fernandina: 1 ♂, 4 ♀,

"ECU[ADOR], GALAPAGOS, Fernandina, Punta Espinosa, 12/V/1992, MVL, leg. B. Landry"; 1 ♀ with same data as above except, "♀ genitalia slide by D. Adamski 3308" [green label]. Floreana: 1 ♂, "ECU[ADOR], GALAPAGOS, Punta Cormoran, 21/IV/1992, MVL, leg. B. Landry"; 1 ♂, 2 ♀ with same data as above except, "23/IV/1992". Genovesa: 2 ♂, "ECU[ADOR], GALAPAGOS, Genovesa, Bahía Darwin, 26/III/1992, MVL, leg. B. Landry" "♂ genitalia slides by D. Adamski 3305", and "3306", [green labels]; 2 ♀, same data as above except, "25/III/1992"; 7 ♀, same data as above except, "♀ genitalia slide by D. Adamski 3301", "3302", and "3307" [green labels]. Isabela: 2 ♂, 1 ♀, "ECUADOR, GALAPAGOS, Isla Isabela, Puerto Villamil, 2/III/1989, MVL, B. Landry", "♂ genitalia slide by D. Adamski, 3157" [green label]; 1 ♂, "1 km W Puerto Villamil, 3/III/1989"; ♂, 2 ♀, "2 km W Puerto Villamil, 5/III/1989", "♀ genitalia slide by D. Adamski 3313" [green label]; 2 ♀, "3 km N S[an]to Tomás Agr[icultural] Zone, 8/III/1989, MVL, B. Landry", "♀ genitalia slide by D. Adamski 3319" [green label]; 3 ♂, "11 km N P[uer]to Villamil, 9/III/1989"; 1 ♂, 1 ♀, "8.5 km N P[uer]to Villamil, 11/III/1989", and "13/III/1989"; 1 ♀, "Tagus Cove, 13/V/1992"; 3 ♀, "V[olcan] Darwin, 300m elev[ation], 15/V/1992"; 2 ♀, "V[olcan] Darwin, 1240m elev[ation], 19/V/1992", "♀ genitalia slide by D. Adamski 3315" [green label]. 1 ♀, "V[olcan] Darwin 630m elev[ation], 17/V/1992". Marchena: 2 ♂, "ECU[ADOR], GALAPAGOS, Marchena, MVL, 12/III/1992, leg. B. Landry"; 1 ♀ with same data as above except, "12/III/1992", "♀ genitalia slide by D. Adamski 3316" [green label]. Pinta: 1 ♂, "ECU[ADOR], GALAPAGOS, Pinta, 13/III/1992, Plaja Ibbeston, MVL, leg. B. Landry"; 1 ♂, 1 ♀, same data as above except, "14/III/1992"; 2 ♂, "15/III/1992, arid zone", "♂ genitalia slide by D. Adamski 3309" [green label]; 1 ♀, "16/III/1992, 200m elev[ation]"; 2 ♀, "17/III/1992,



Figs. 14-15. Female genitalia. 14, *Calosima darwini*. 15, *Blastobasis normalis*. Line scale = 1.0 mm.

400m elev[ation]”, “Wing slide by D. Adamski, 3351” [green label]; 1 ♂, “18/III/1992, 400m elev[ation]”, “♂ genitalia slide by D. Adamski 3310” [green label]; 2 ♂, “21/III/1992, (+, -) 15m elev[ation]”. San Cristóbal: 2 ♀, “ECUADOR, GALAPAGOS, San Cristobal, 2 km SW P[uer]to Baquarizo [sic], 11/II/1989, MVL, B. Landry”. The following specimens with same data as above except, 5 ♀, “14/II/1989”, “17/II/1989”, 2 ♀, “18/II/1989”, “22/II/1989”; 3 ♂, “4 km SE P[uer]to Baquarizo [sic], 12/II/1989”, “♂ genitalia slide by D. Adamski 3311” [green label]; 4 ♂, “1 km SE El Progreso, 14/II/1989”, “♂ genitalia slide by D. Adamski 3300” [green label]; 1 ♂, “pampa zone, 15/II/1989”; 1 ♂, “P[uer]to Baquarizo [sic], 17/II/1989”; 2 ♂, “pampa zone, 18/II/1989”; 3 ♂, “4 km SE P[uer]to Baquarizo [sic], 20/II/1989”; 2 ♂, “base of Cerro Pelado, 22/II/1989”, “♂ genitalia slide by D. Adamski 3356” [green label]; 1 ♂, “2 km SW P[uer]to Baquarizo [sic], 11/II/1989”, “♂ genitalia slide by D. Adamski 3299” [green label]; 1 ♂, same data as above except, “20/II/1989”. Santa Cruz: 6 ♂, 2 ♀, “ECUADOR, GALAPAGOS, 4 km N Puerto Ayora, 20/I/1989, MVL, B. Landry” “♂ genitalia slide by D. Adamski 3292” and “3158” [green labels], “♀ genitalia slide by D. Adamski 3289”, and “3290” [green labels]; 1 ♂, “Los Gemelos, 31/I/1989”; 2 ♂, 9 ♀, “Tortuga Res[erve] W S[an]ta Rosa, 6/II/1989, MVL, B. Landry”, “♂ genitalia slides by D. Adamski 3296”, and “3298” [green labels], “♀ genitalia slides by D. Adamski 3159”, “3291”, and “3297” [green labels]; 3 ♂, 2 ♀, “2 km W Bella Vista, 27/II/1989”, “♂ genitalia slide by D. Adamski 3294” [green label], “♀ genitalia slide by D. Adamski 3295” [green label]; 1 ♂, 1 ♀, “Finca S Devine, 17/III/1989”. Santiago: 3 ♂, “ECU[ADOR], GALAPAGOS, Santiago, Bahia Espumilla, 4/IV/1992, MVL, leg. B. Landry”; 2 ♂, 4 ♀, same data as above except, “200m elev[ation], 5/IV/1992”; 2 ♂, 1 ♀, “Aguacate, 520m elev[ation], 6/IV/1992”, “7/IV/1992”, and “12/IV/1992”; 1

♂, “Central, 700m elev[ation], 9/IV/1992”; 1 ♂, 2 ♀, “Cerro Inn, 28/III/1992”.

Remarks.—*Blastobasis normalis* is not endemic to the Galápagos Islands as once thought. This species is now known to occur on the Ecuadorian mainland as well.

DISCUSSION

Adamski (*in* Adamski and Brown, 1989) provided a phylogenetic classification for the North American Blastobasinae that included evidence for the monophyly of both *Blastobasis* Zeller and *Calosima* Dietz. *Blastobasis normalis* shares all synapomorphies typical for the genus except the posterior lobe of the corpus bursae. Similarly, *Calosima darwini* shares all synapomorphies for the genus except an emarginate juxta, valva with secondary articulatory process, and absence of the proximal flange. Whether *Calosima darwini* is endemic to the Galápagos is questionable. This question can be reasonably addressed only after the fauna of Central and South America is better known.

ACKNOWLEDGMENTS

We thank K. Sattler, M. Shaffer and K. Tuck of The Natural History Museum, London, England, for loan of the lectotype of *Auximobasis normalis* Meyrick and holotype of *Blastobasis crotospila* Meyrick. The late Robert Silberglied provided specimens of *Calosima darwini* that he collected from the Galápagos Islands. We also thank the authorities of the Ecuadorian Ministry of Agriculture, the Galápagos National Park, and the Charles Darwin Research Station for kindly allowing field work and providing logistical support to B. Landry in 1989 and 1992. Joyce Cook, Moraima Inca, Ricardo Palma, Stewart B. Peck, Bradley J. Sinclair and Eduardo Vilema were excellent and most helpful companions. Finally, we are extremely grateful to Stewart B. Peck, Carleton University, Ottawa, Canada, for providing financial support for field work and costs of reprints through an operating grant for field research on arthropod

evolution from the Natural Sciences and Engineering Research Council of Canada.

LITERATURE CITED

- Adamski, D., and R. L. Brown. 1989. Morphology and systematics of North American Blastobasidae (Lepidoptera: Gelechioidea). Mississippi Agricultural Forest Experiment Station Technical Bulletin 165 (Mississippi Entomological Museum No. 1), 70 pp.
- Beebe, W. 1923. Notes on Galápagos Lepidoptera. *Zoologica* (New York) 5: 50-59.
- Butler, A. G. 1877. Lepidoptera. In Günther, A., ed., Account of the zoological collection made during the visit of H.M.S. "Peterel" to the Galápagos Islands. Proceedings of the Zoological Society of London, 1877: 86-91.
- Clarke, J. F. G. 1941. The preparation of slides of the genitalia of Lepidoptera. *Bulletin of the Brooklyn Entomological Society* 36: 149-161.
- . 1955-70. Catalogue of the Type-Specimens of Microlepidoptera in the British Museum (Natural History) described by E. Meyrick. 8 Vols. [Vol. 4. 1963. 521 pp.]. British Museum (Natural History, London).
- Hayes, A. H. 1975. The larger moths of the Galápagos Islands (Geometroidea, Sphingoidea & Noctuoidea). *Proceedings of the California Academy of Sciences* (San Francisco) 40: 145-208.
- Heppler, J. B. 1984. In Heppler, J. B., ed., Atlas of Neotropical Lepidoptera. Checklist: Part 1. Micropterigoidea-Immoidea. Dr. W. Junk Publishers, The Hague, The Netherlands, xiv + 112 pp.
- Heppler, J. B. and B. Landry. 1994a. A new *Tebenna* species from the Galápagos Islands (Lepidoptera: Choreutidae). *Tropical Lepidoptera* 5(2): 123-125.
- . 1994b. A new sun moth from the Galápagos Islands (Lepidoptera: Helioidinidae). *Tropical Lepidoptera* 5(2): 126-128.
- Hodges, R. W. In press. Gelechioidea. In Kristensen, N. P., ed., *Handbuch der Zoologie*.
- Kornerup, A. and J. H. Wanscher. 1978. *Methuen Handbook of Colour*. 2nd ed. Methuen and Co., Ltd., London, 243 pp.
- Landry, B. 1993. Additions to the knowledge of the Pterophoridae (Lepidoptera) of the Galápagos archipelago, Ecuador, with descriptions of two new species. *Zoologische Mededelingen* (Leiden) 67: 473-485.
- Landry, B. and C. Gielis. 1992. A synopsis of the Pterophoridae (Lepidoptera) of the Galápagos Islands, Ecuador. *Zoologische Verhandelingen* (Leiden) 276: 1-42.
- Landry, J.-F. and B. Landry. 1994. A technique for setting and mounting microlepidoptera. *Journal of the Lepidopterists' Society* 48: 205-227.
- Linsley, E. G. 1977. Insects of the Galápagos (Supplement). *Proceedings of the California Academy of Sciences* (San Francisco), 33: 113-196.
- Linsley, E. G. and R. L. Usinger. 1966. Insects of the Galápagos Islands. *Proceedings of the California Academy of Sciences*, 4th series 33(7): 113-196.
- Meyrick, E. 1894. On a collection of Lepidoptera from upper Burma. *Transactions of the Entomological Society of London* 1894: 1-29.
- . 1918. *Exotic Microlepidoptera*. Vol. 2, 640 pp.
- . 1926. Microlepidoptera from the Galápagos Islands and Rapa. *Transactions of the London Entomological Society* 74: 269-278.
- Parkin P., D. T. Parkin, A. W. Ewing, and H. A. Ford. 1972. A report on the arthropods collected by the Edinburgh University Galápagos Islands Expedition, 1968. *The Pan-Pacific Entomologist* 48(2): 100-107.
- Schaus, W. 1923. Galápagos Heterocera with descriptions of new species. *Zoologica* (New York) 5: 23-48.